Predatory Impacts on Stocked Chinook Salmon Smolts in Milwaukee Harbor - 1999

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Introduction

The Wisconsin Department of Natural Resources (WDNR) stocked approximately 144,000 chinook salmon smolts in McKinley Marina on the afternoon of May 3, 1999. Initially it was planned to hold the smolts for 48 hr in net pens that were set up in the marina by the Milwaukee Area Great Lakes Sports Fisherman Club (see Map 1). This site was selected based on previous surveys, which suggested that very few predators existed in the area. The net pens were assembled and suspended in the water a week prior to the stocking day. Due to heavy algal bloom accumulation, the pens were completely clogged by algae on the day of stocking and appeared not conducive to hold smolts in the pens due to poor water circulation. Therefore, the entire load of 144,000 chinook smolts were released directly into the harbor water at the site of the net pens.

Walleye are being stocked in the Lower Milwaukee River as part of walleye restoration program. However, some anglers were concerned that stocking walleye fingerlings in Milwaukee River would negatively impact the salmon fishery. The objective of this study was to evaluate the predation impact of stocked walleye on stocked salmonid smolts in the Milwaukee harbor.

Method

The Lake Michigan Work Unit (LMWU) sampled predatory fish on the night following stocking (May 4, 1999) using two types of gear – boom shocker and gill nets. We set a 400' gill net (50' panels of mesh sizes - 2", 2.5", 3" and 3.5") at three different locations (McKinley Marina, outside of the Summerfest lagoon and off Pieces of Eight) from approximately 6 PM to 10 PM. All the predatory fish were removed from the net and their stomach contents were collected using a non-lethal stomach pump. If the fish were dead, the stomach samples were collected by removing the stomach. Stomach contents were poured into a plastic bag, labeled and stored on ice for further analysis.

The gill net effort was additional effort this year to increase the sample size by capturing predators that were not accessible to electrofishing. A boom shocker was used on the same night at McKinley Marina and inside the Summerfest lagoon to sample in the shallow waters.

Results

A total of 50 predators of different species (7 walleye, 6 northern pike, 24 smallmouth bass, 3 largemouth bass, 7 brown trout, and 3 brook trout) were captured (Table 1).

Thirty-four fish had some food items in their stomach (Table 2). The majority of fish were captured at Summerfest lagoon during the electrofishing effort. The McKinley Marina and Pieces of Eight gill net sets together had only 8 fish - 1 smallmouth bass, 2 northern pike, 2 brook trout and 3 brown trout (Table 1). Except for two brook trout and a brown trout, the gill net at McKinley Marina did not have any other predators.

The majority of the stomach samples consisted of partially digested sticklebacks and/or alewife (Tables 3 and 4). The number of sticklebacks in a stomach varied from 1 to 15. All six walleyes had partially digested fish. Only two stomachs had salmonids in them – one was a smallmouth bass with a brook trout and the other one was northern pike with possibly a steelhead smolt.

None of the stomachs had any chinook smolts in them. Except one smallmouth bass we did not come across any other predatory fish when electorofishing in McKinley Marina, nor any chinook smolts. It is possible that the smolts may have dispersed well from the site of stocking.

For the purpose of walleye population estimation, we conducted four nights of boom shocking to mark walleyes. A total of 37 walleye were captured between two sites – one below the former North Ave. dam site and the second one being Summerfest lagoon. We did not find any marked fish in our recapture effort. The data were insufficient to estimate walleye population in the area.

Table 5 summarizes the average size in length of different year classes stocked in the Lower Milwaukee River. Based on the growth rate the walleye in the River/Harbor appear to be growing well.

Discussion

After the preliminary study in 1996 and 1997 several alternatives were looked into as a measure of reducing predatory impacts on stocked chinook salmon smolts (WDNR 1998). The WDNR changed stocking location to McKinley Marina in 1998. In addition, the smolts were held for 48 hours in net pens (Hirethota and Coffaro 1999). Following the release of chinook salmon smolts, we conducted stomach analysis of predators in the harbor. The results indicated that none of the walleye stomach had any chinook salmon smolts, and smolts dispersed quickly (Hirethota and Coffaro 1999). The predatory impact analysis during the 1999 sampling effort also revealed a similar pattern.

In 1999, due to the algal infestation on the net pens, we could not hold the smolts in the net pens. The smolts were directly stocked into the marina water. During the electrofishing effort on the following night, we did not find any large predators in the McKinley Marina nor any smolts. There were no large predators in the gill net sample either. None of the predators sampled in all three locations sampled in the vicinity of smolt stocking had any chinook smolts in the stomach.

Based on the two years' (1998 and 1999) data it appears that the change of stocking site turned out to be quite effective in reducing the predation impact. Although smolts were directly released to the marina without holding in the net pens, they seemed to have dispersed very fast.

Management Recommendations

- In light of the above finding, it appears that a limited effort will be adequate in the future to sample and analyze predatory fish in the area.

- The role of net pens in reducing the predation impact is unclear. Both in 1998 and 1999 sampling effort we have documented a lack of predators at Mckinley Marina and the smolts appear to disperse very quickly. While the benefits of net pens are unclear, we will continue to use net pens as long as the cooperating clubs are interested in continuing the joint project.

- Since the population size is so small, we could not get enough data to estimate walleye population size in the harbor. Therefore, we recommend that population size estimation be suspended until further decision.

- The stocking of walleye should be continued using Great Lakes strain walleye as per previous plan.

- The chinook salmon smolts will continue to be stocked in McKinley Marina.

Reference

Hirethota, P.S. and M. Coffaro. 1999. Analysis of stomach content and populations estimation of walleye in the lower Milwaukee river.

WDNR, 1998. An assessment of the impact of stocked walleye on stocked salmonids in the Milwaukee estuary.

Acknowledgment

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Table 1. Number of predatory fish captured by gear type and by location in the Milwaukee harbor, 1999.

Location \ Gear type	**Boom shocker**	**Gill net**
McKinley Marina	1 smallmouth bass	1 brown trout and 2 brook trout
Pieces of Eight	No Data	2 brown trout, 1 smallmouth bass, and 2 northern pike
Summerfest Lagoon	(Inside) 3 brown trout, 23 smallmouth bass, 3 largemouth bass, 3 walleye, and 3 northern pike	(Outside) 1 brown trout, 4 walleye, 1 northern pike, 1 brook trout, 1 yellow perch, 1 rock bass, and 1 pumpkin seed

Table 2. Number of predatory fish captured by species and number of stomach samples taken, 1999.

Fish species	**Number captured**	**Number of stomach samples taken**
Walleye	7	6
Northern pike	6	5
Smallmouth bass	24	15
Largemouth bass	3	1
Brown trout	7	6
Brook trout	3	1

Table 3. Stomach content analysis of predatory fish species captured by boom shocker in the Milwaukee Harbor (inside Summerfest lagoon), May 4, 1999.

#	Walleye	Smallmouth bass	Largemouth bass	Brown trout	Northern pike
1	UFVC - 2	Stickleback - 4	SDF - 1	Stickleback -15 (8 3-spine stickleback, 1 9-spine stickleback, 6 other stickleback)	Alewife - 1; Steelhead smolt - 1
2	UFVC - 2	SDF- 1		Alewife - 3	Alewife - 1
3	UFVC - 1	Alewife - 1; Stickleback - 1			Alewife – 2
4		SDF - 1			
5		Brook trout - 1			
6		Stickleback- 1			
7		Stickleback - 3			
8		SDF - 1			
9		Crayfish - 1; Sculpin - 1; Tapeworm - 1; Stickleback - 1; UFVC - 1			
10		UFVC - 1			
11		Zebra mussel - 1			
12		SDF - 1			
13		SDF - 1			
14		Stickleback - 2			

Abbreviations: UFVC = Unidentified Fish Vertebral Column; SDF = Semi Digested Fish

Table 4. Stomach content analysis of predatory fish species captured in the gill net in Milwaukee Harbor, May 4, 1999.

#	Walleye	Smallmouth bass	Brown trout	Brook trout	Northern pike
1	*SDF - 1	Stickleback - 3	[a]Stickleback - 4	[a]Alewife - 1	Alewife - 1
2	*SDF - 2		Alewife - 3		UFVC - 1
3	*SDF - 1		Alewife - 3		
4			*UFVC - 1		

Abbreviations: UFVC = Unidentified Fish Vertebral Column; SDF = Semi Digested Fish

* Fish caught in the gill net set out side Summerfest lagoon; [a] Fish caught in the gill net inside McKinley Marina; the rest were caught in the gill net at Pieces of Eight.

Table 5. Stocking numbers, size-at-stocking and size-at-capture of walleye stocked in the Lower Milwaukee River and Harbor.

Year of stocking	Number stocked	Average size at stocking (October) (mm)	Mark type Finclip/ Elastomer	Average size (mm) at capture (May and September)				
				1996	**1997**		**1998**	**1999**
				May	May	September	May	May
1995	7,626	161	RP Red Elastomer	162 (69) 161 (85)	238 (3) 233 (2)	337 (1) 387 (1)	427 (13) 449 (17)	465 (1) -
1996	9,972	187	LP Green Elastomer		183 (61) 191 (68)	306 (15) 302 (10)	309 (39) 314 (52)	413 (17) 427 (9)
1998	3,155	169	RV Blue Elastomer					220 (2) 172 (2)

Finclip code: RP= right pectoral; LP= left pectoral; RV = right ventral
Elastomer color code: Red, Green and Blue
Note: Number in the parenthesis is the sample size